

# CYPERUS DIFFORMIS L. (CYPERACEAE) IN NORTH AMERICA

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*Cyperus difformis* is a widespread species of southern Europe and the tropics of the eastern hemisphere (Kükenthal, 1936; Koyama, 1961; Ohwi, 1965). It is spreading and becoming established in North America like many other oriental introductions, e.g., *C. haspan*, *C. iria*, and *C. rotundus*. In North America, it was first noted in México, then in the United States, and now can be reported in Nicaragua, Central America.

Early American collections and literature on the species date back to the 1850's. In his monograph on North American Cyperaceae, Torrey (1836) did not list or mention *C. difformis*. Later Torrey (1859) reported a collection (1851-1852) as *C. lateriflorus* from México. Britton (1886) noted the presence of *C. lateriflorus* in North America as being nearly allied to *C. difformis* of the old world and may be the same. Howell (1934) reported *C. difformis* in the United States from California; Fernald (1935), from Virginia. Numerous other collections have expanded the known range into Alabama, Arizona, Louisiana, North Carolina, and Oklahoma. The known distribution of *C. difformis* is given in Figure 1.

*Cyperus difformis* is native to the tropics of the eastern hemisphere specifically tropical and western Asia. It is a common weed in a number of habitats but most commonly found in rice paddies. The annual plant, with culms 15-60 cm tall, is similar in habit to *C. haspan* but can be distinguished from it by its subglobose spikes and obovate scales (Fig. 2). Correll & Correll (1972) has a description of the species. *C. difformis* was placed in section *Fusci* by Kükenthal (1936) and there it is most closely related to *C. fuscus* of Europe and western Asia which also has been introduced into North America.

## HISTORY AND LITERATURE

The earliest known American collection of *C. difformis* is that of Charles Wright from Sonora, México, in 1851. Wright's specimen 1950 was described as a new species, *C. lateriflorus*, by Torrey (1859). Ayers (1946) did not mention the Wright specimen in his treatment of the genus in México citing only those previously cited by McGivney (1938) who cites Wright "1960" from "New Mexico." Wright actually collected the species in Sonora, and McGivney's citation of "1960" was apparently a misprint or was miscopied because the label clearly shows 1950.

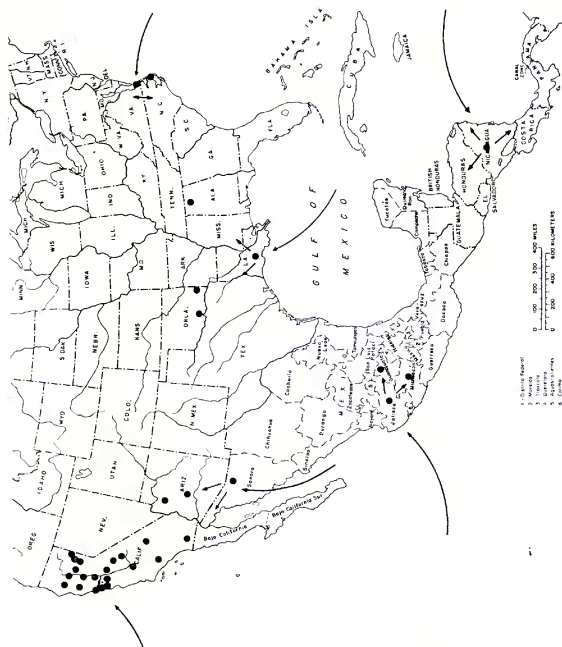


Fig. 1. Distribution of *Cyperus difformis* in North America. Long curved arrows indicate probable points of introduction and short straight arrows possible migration of the species.

Wright's collecting was done in association with the U.S. Mexican Boundary Commission in 1851. He accompanied Colonel Graham of the Topographical Engineers between 2 Sep–4 Oct on a trip from Santa Rita, New Mexico, to Santa Cruz, Sonora. During the latter part of this trip (29 Sep), Wright collected the *Cyperus* just east of Santa Cruz. Wright's (1949–52)

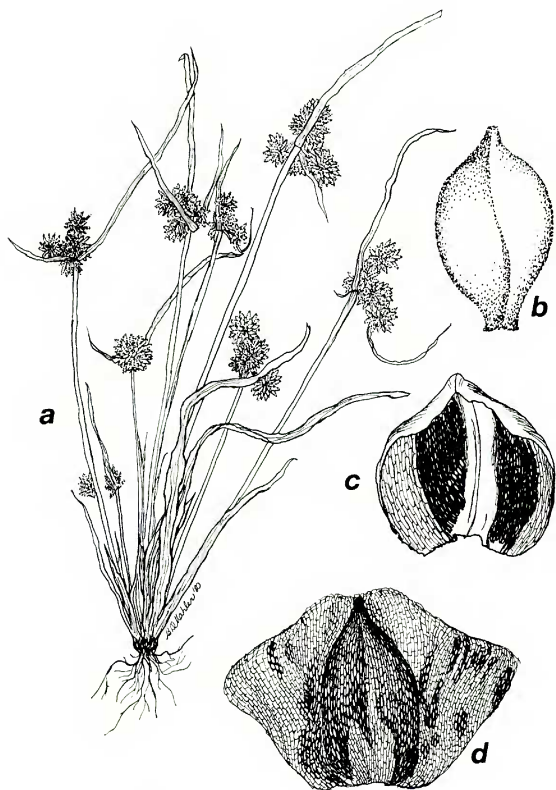


Fig. 2. *Cyperus difformis* L. A. habit, B. achene, C & D. scale (from Delaboussaye 71.)

field notes give the following data: along mountain torrents east of Santa Cruz, 29 Sep 1851, *Wright* 674. Wright's field number of 674 is the same as "*Wright* 1950" assigned by Gray for distribution.

Wright's collections of 1849–1852 from southwestern United States create a problem for botanist who try to work with his plants. Gray, who received and processed the specimens, sent them out under a new set of numbers and not under Wright's own field numbers. Wooton (1906) noted that the specimens of the 1851 and 1852 collections were under the same printed label and this made it difficult, if not impossible, to fix localities and exact dates of collections. Most of the printed labels do not show the habitat or exact locality and date as given in Wright's field notes (Wooton, 1906).

Since Wright's collection, additional collections of *Cyperus difformis* in 1890 and 1909 were reported by McGivney (1938) in southern México. It was 25 years later that the species was first collected in the United States. Howell (1934, 1949, 1958) first reported it from California followed by Fernald (1935) from Virginia. It was then reported from Arizona by Kearney and Peebles (1951). Additional reports from the United States are Thieret (1964) from Louisiana, Correll and Correll (1972) from Oklahoma, Tyndall et al. (1977) from North Carolina, and Godfrey and Wooton (1979) from Alabama.

#### INTRODUCTION AND DISTRIBUTION

The data on introduction and distribution of *Cyperus difformis* follows a chronological order based on label data taken from specimens examined. The data of the earliest collections, as well as others, does not necessarily indicate the time of introduction, establishment or the direction of migration.

*Cyperus difformis* was first collected on the North American continent in northern México. However, this first collection does not establish this locality and date as the time or place *C. difformis* was introduced. The earliest reference to *C. difformis* in North America was Torrey (1859). A search of earlier literature [Bentham, (1839–1857); Humboldt et al. (1815); and Kunth (1822)] yielded no mention of *C. difformis*. However, since the plant was probably present (maybe even several years) before collection, it would be reasonable to assume that the approximate time of introduction was sometime between 1815–1851. The first collection was reported by Kükenthal (1936) who cites *Wright* 1950, Santa Cruz, New Mexico. McGivney (1938) also cited it from New Mexico and it has since been erroneously reported from New Mexico in various treatments, e.g. Correll & Correll (1972), Godfrey & Wooton (1979), Kearney & Peebles (1951, 1960), and Tidestrom & Kittell (1941).

Additional specimens examined: MÉXICO: Guanajuato: 1 mi NW of Salamanca, *Waterfall & Wallis* 13901 (SMU). Jalisco: near La Barca, *Pringle* 3261 (ENCB). Michoacán: valley of the Lerma, *Pringle* 3261 (MO); vicinity of Morelia, *Arsene*

3173 (MO); vicinity of Morelia, *Arsene* 3092 (MO).

Based on herbarium specimens from México and the United States *C. difformis* appeared in the United States flora some 65 years later than México. It was first collected in California in 1915: Butte Co.: very abundant in canals, ditches, roads, and fields, Jul 1915, *Johnston W132J* (NY). Howell (1934) published the first United States report of *C. difformis* based on a 1921 collection from California: Butte Co.: weed abundant in rice fields, Nelson, 25 Nov 1921, *McLearn* 15 (CAS).

Additional specimens examined: CALIFORNIA: Alameda Co.: 16th Street Statin, Oakland, 8 Jul 1935, *Jussel s.n.* (CAS). Butte Co.: rice fields, 9–10 Aug 1921, *Kennedy s.n.* (UC); Sanford slough, SW corner of Butte Co., *Mason & Grant* 12636 (UC); Gray Hodge Game Refuge NW of Pennington, *Mason* 12737 (CAS, UC); Sacramento Outing Club, *Mason & Grant* 13024 (DS, UC); rice plots, Biggs Rice Experiment Station, *Tucker* 2680 (CAS, SMU, UC); eastern outskirts of Oroville, *Howell* 34637 (NY). Colusa Co.: Colusa rice fields, 18 Sep 1925, *Kennedy s.n.* (UC); rice fields, *Dunshee* 14 (UC); rice fields, 3 mi W of Williams, *Howell* 19838 (CAS, DS, MO, NY, SMU, UC); 8 mi N of Colusa, *Mason & Grant* 12983 (UC); 2 mi W of Colusa on Williams hwy., *Mason & Grant* 13011 (UC); 1.6 mi W of Williams, *Mason & Grant* 13116 (UC); rice field, 3 mi W of Williams, *Nobs & Smith* 1877 (UC). Fresno Co.: King's River E of Burrel, *Mason & Smith* 8341 (DC, UC). Glen Co.: edge of pond S of Willows Migratory Wildfowl Refuge, *Beetle* 3061 (UC). Kern Co.: Tupan hwy 1/4 mi S of Adohr Rd., *Twisselmann* 6580 (CAS, NY); Lake Wooloomes near Delano, *Twisselmann* 8957 (CAS). Madera Co.: Crocker-Hoffman Ranch near Merced, *Wagnon* 4a (UC); San Joaquin River just E of Firebaugh, *Twisselmann* 9131 (CAS). Marin Co.: Mt. Tamalpais, camp above Marin Woods, *Howell* 20771 (CAS). Merced Co.: 0.5 mi S of Lake Yosemite, 27 Jul 1938, *Wagnon s.n.* (UC); Crane Ranch S of jct of Merced & San Joaquin rivers, *Mason & Smith* 8328 (UC); Los Banos Bird Reserve, *Jussel* 90 (CAS); San Joaquin River 0.25 mi S of hwy 152 2.9 mi E of Santa Rita Park, *Wiggins & Wiggins* 20701 (DS, ENCB, NY). Nevada Co.: Wolf Creek 1 mi N of Nevada-Placer Co. line, *Nobs & Smith* 1534 (UC). Plumas Co.: near Virgilia, *Howell* 35064 (NY). Sacramento Co.: American River at Fair Oaks, *Crampton* 1713 (CAS). San Diego Co.: Balboa Park, *Gander* 8893 (DS, UC). San Francisco Co.: Lake Merced, 7 Aug 1953, *Bush s.n.* (CAS). Santa Barbara Co.: Las Positas Rd. near Fox Canyon, 12 Oct 1962, *Pollard s.n.* (CAS, ENCB); Las Positas Rd., near jct of Veronica Springs Rd., 3 Nov 1962, *Pollard s.n.* (MO, NY, SMU); 3 Nov 1963, *Pollard s.n.* (CAS). Sonoma Co.: Guerneville, *Rubtzoff* 2919 (CAS). Stanislaus Co.: 4 mi S of Oakdale, *Hoover* 57 (CAS); Claus, *Hoover* 1628 (UC). Sutter Co.: 6.3 mi E of Knight's Landing, 6 Jul 1938, *Cantelow s.n.* (CAS); Sutter by-pass on Yuba City Knight's Landing hwy, *Mason* 12705 (NY, UC); 1.7 mi S of Robbins, *Howell* 50876 (NY). Tehama Co.: Pacific hwy 0.5 mi N of Butte Co. line, *Heller* 14804 (MO, NY, UC). Tulare Co.: Pixley Nat. Wildlife Refuge, *Twisselmann* 11590 (CAS).

#### KNOWN RECORDS FROM OTHER STATES

VIRGINIA. The collection of *C. difformis* from Virginia in 1934 (Fernald, 1935) is apparently the only one known from the state. This probably represents a separate and direct introduction from Asia than from the west coast. Its most probable source of introduction is in rice-straw used in packing,

as suggested by Fernald.

ARIZONA. *Cyperus difformis* was first reported as likely to occur in Arizona by Kearney & Peebles (1942). "Not known definitely to occur in Arizona but has been collected at Santa Cruz, Sonora, about 20 miles south of the international boundary." The following specimens are known from Arizona. Maricopa Co.: swamp area below dam of Lake Pleasant Regional Park, 8 Oct 1964, *Lehto* 5461 (NCU). Mohave Co.: Goose Lake of Havasu Lake Refuge near Toprock, 27 Oct 1948, *Monson s.n.* (CAS). These collections probably represent introductions from México or California.

LOUISIANA. Thieret's report of *C. difformis* in Louisiana is based on the following collection: Lafayette Parish: rice field 13 mi W of Lafayette, 23 Oct 1963, *Delaboussaye* 71 (SMU). Through correspondence, Thieret indicated he had later collected the species in Lafayette Parish but at a different locality: Lafayette Parish: rice fields, 2 mi NW of Indian Bayou, 10 Sep 1977, *Thieret* 50236 (KNK). These collections are probably independent introductions from Asia.

OKLAHOMA. The Oklahoma report was made by Correll and Correll (1972): Lefflore Co.: gravel bars along spillway of Lake Wister, 17 Sep 1970, *Correll & Correll* 39765 (TEX). One additional specimen can be reported from Johnston Co.: moist soil along Blue River, 24 Sep 1977, *Puckett* 36 (SMU). This specimen was a gift from Dr. Mickey Cooper of Cameron University and was collected on a class field trip through southeastern Oklahoma. The source and origin of introduction of these are questionable. It is possible that they have originated from the populations in Louisiana.

ALABAMA. Limestone Co.: bottoms of Tennessee River of Wheeler National Wildlife Refuge N of Dekatur, 22 Sep 1970, *Kral* 41221 (ENCB, NCU, SMU). *C. difformis* has only recently been reported from the state by Godfrey & Wooten (1979).

NORTH CAROLINA. Dare Co.: ca 1.5 km N of Duck, along the shoreline of Currituck Sound, with *Scirpus americanus*, 2 Oct 1978 *Tyndall* 791 (ODU, SMU). It was first collected 14 Oct 1974 at the same location, *Tyndall s.n.* (ODU) and has only recently been reported from North Carolina by Tyndall et al. (1977).

#### DISTRIBUTION IN CENTRAL AMERICA

Early studies—e.g., Clarke (1908), Hemsley (1882-1886), and Standley (1930)—do not list *C. difformis* from Central America. Hemsley's report of the species is that of *C. lateriflorus* from Sonora.

The only collection examined was collected in 1969 in Nicaragua. Matagalpa: beside pond, Rte 1, S of Dario, Calabazas, 25 Dec 1969, *Atwood* 2566 (SMU). This has recently been reported from Nicaragua by Seymour (1980) as *C. haspan* with duplicates at BM, ENAG, F, GH, NY, WDP. The nearest known localities are reported in this paper and are about 1000-1100 miles to the northwest in Michoacán. It is unknown whether or not

*C. difformis* has become established in Nicaragua. The specimen was mature when collected and had already dropped "seed," thus probably establishing the original source or increasing the existing population.

#### SUMMARY AND DISCUSSION

*Cyperus difformis* was originally described by Linnaeus in 1756. The habitat noted by Linnaeus was in India. It is suspected and generally accepted that, by means of man, especially with the introduction of rice, *C. difformis* has spread to the new world tropics and subtropics of Central and North America. Since the introduction of it into the United States, probably around 1910–1915, it has become established through the southeast and southwest from Virginia to California. Since being introduced in California it has spread over much of the state as a weed and has become a potential problem in certain rice-growing regions.

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